

## CLAIMS

What is claimed is:

5                   1. A solenoid actuator for linearly actuating a  
device, comprising:  
a) a primary pole piece having a first annular portion;  
b) a secondary pole piece having an outer axial face  
oriented away from said device and a second annular portion, said second portion being  
10 axially separated from said first portion to form an air gap therebetween; and  
c) an armature disposed for slidable axial motion within  
said first and second annular portions, said armature having a side wall terminating in a  
leading face oriented toward said device and a trailing face oriented away from said  
device, wherein said leading face and said trailing face are each substantially  
15 orthogonal to the direction of said axial motion, and wherein said trailing face remains  
outside said secondary pole piece at all axial positions of said armature.

2. A solenoid actuator in accordance with Claim 1 wherein said first  
annular portion of said primary pole piece is tapered.

20                   3. A solenoid actuator in accordance with Claim 1 where in said second  
annular portion of said secondary pole piece is tapered.

4. A poppet valve assembly for proportionally controlling flow of a fluid, the assembly including a solenoid actuator comprising:

a) a primary pole piece having a first annular portion;

b) a secondary pole piece having an outer axial face

5 oriented away from said device and a second annular portion, said second portion being axially separated from said first portion to form an air gap therebetween; and

c) an armature disposed for slidable axial motion within

said first and second annular portions, said armature having a side wall terminating in a

leading face oriented toward said device and a trailing face oriented away from said

10 device, wherein said leading face and said trailing face are each substantially orthogonal to the direction of said axial motion, and wherein said trailing face remains outside said secondary pole piece at all axial positions of said armature.

5. A poppet valve assembly in accordance with Claim 4 wherein said

15 assembly is an exhaust gas recirculation valve and wherein said fluid is exhaust gas from an internal combustion engine.